Report:
Effectiveness of Nagging in Reducing Energy Consumption
One Year's Data for Bldg. 810, Sandia National Laboratories

Introduction

Bldg. 810, one of the newest and presumably most energy efficient buildings at Sandia, consumes approximately 375,000 kw-hrs of electricity per month, roughly the same as 700 average Albuquerque homes. There are approximately 500 residents in the building, which means that each occupant on average uses far more than an entire house full of people (and no one has a big-screen TV in their office either). Of course, there are clear reasons for this, not the least of which is that Americans just love to burn fossil fuel, even when it is non-productive. Polluting the environment, after all, is our Heaven-given right and we exercise more frequently than we exercise our extremities (though not more frequently than we exercise our mouths).

The costs of this profligate consumption, to the environment and Sandia's treasury are enormous. In rough dollar terms, electricity consumption alone costs about $21,000 a month (about $250,000 on an annualized basis), and also results in the following annual environmental impacts:

> 2,250 metric tons of CO2 dumped into the air
> 150 metric tons of sulfur dioxides and nitrogen oxides of various flavors to tarnish the chrome off of trailer-hitches and exacerbate asthma amongst the population
> enough particulate pollution to make it impossible to see downtown Los Angeles on even a GOOD day
> 3 million gallons of water for cooling of the turbines that generate electricity (and we don't have a lot of water).
> Run-off (from slag-heaps of burned coal, our predominant fuel for electricity in New Mexico) that puts mercury, cadmium and other toxins into the ground water and probably the atmosphere as well. Ingestion of these heavy metals are about as healthy as smoking cigarettes, and not recommended.

Surely – as a DOE ENERGY lab for Heaven's sake – we can do better than this.

Enter the Nag

As Darwin proved many years ago, when a niche is empty, something will evolve to fill it (he didn't really say that, but hey, it's good enough for physicists and engineers). And, PRESTO, the Energy Nag was born. This creature, never actually seen by anyone in Bldg. 810, took it upon himself (it might be "herself" – the Nag isn't sure) to alert caring Sandians (and even a few uncaring ones) about the effects of our daily activities on the environment.

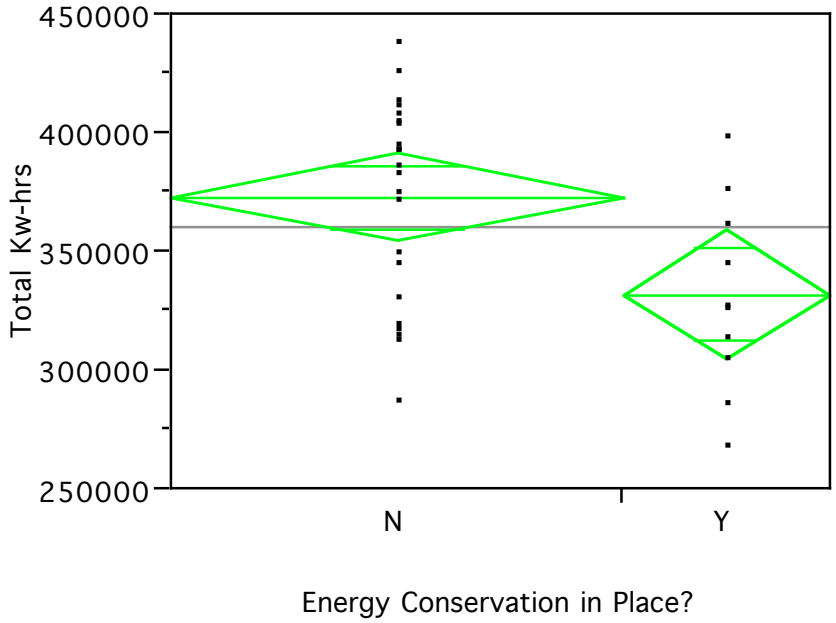
The Nag began sending out "Nag Rag" letters to Bldg. 810 residents in mid-July of 1991. Even more important, the Nag worked with ace Building Operator Bob Washington to identify simple things that could be done to save on electricity, particularly on weekends when NO ONE (except the Nag) is in the building. The Nag and Mr. Washington noted that, on a hot Sunday afternoon, the interior of Bldg. 810 was cooled to a comfortable 32 degrees Fahrenheit – perfect for storing beer, except that DOE regulations forbid alcohol on the Sandia campus. So, while drinking beer together one night in Bob's office (oops! The Nag probably shouldn't have said that), we determined that we could safely shut off air-conditioning after hours – taking into account those FEW areas in Bldg. 810 that require continuous cools (like the Nag's office where the beer is stored) – and save a lot of juice. In addition, the Nag began a campaign to personally turn off lights, copiers, coffee pots, radios, fans, heaters (yes, HEATERS are used in some parts of 810 because it is too COLD in the summer!!!), printers, computers, computer screens, and the whole array of items which would be JUST TRAGIC TO TURN OFF AFTER HOURS. The Nag Rag suggested the same, on a more-or-less weekly basis (except in the aftermath of September 11, when the Nag knew that people had other things to worry about).

The Results

Courtesy of the ever vigilant Ralph Wrons (the Sandia Energy Meister), the Nag was able to get weekly and monthly consumption figures for Bldg. 810. There are two "circuits" in 810; circuit one (1) is for the HVAC and lights; circuit two (2) is for plug load (for the lawyers, that means consumption due to things you plug into the wall, like your fingers, or your tongue). The two circuits together represent the TOTAL load of the building.

Below, you (or whoever is reading this report to you) will find a statistical analysis geared to answer the question: "Just what has the Energy Nag wrought?" (the Nag has always wanted to "wreak" something, even in the past pluperfect).

Oneway Analysis of Total Kw-hrs By Energy Conservation in Place?



Oneway Anova

Summary of Fit

Rsquare	0.177141
Adj Rsquare	0.149712
Root Mean Square Error	42176.18
Mean of Response	359564.8
Observations (or Sum Wgts)	32

t-Test

Assuming equal variances

	Difference	t-Test	DF	Prob > |t|
Estimate	40877.9	2.541	30	0.0165
Std Error	16085.4			
Lower 95%	8027.2			
Upper 95%	73728.6			

Analysis of Variance

For the uninitiated (lawyers, doctors, and other non-scientists) what this means is this:

1. Since the Nag started Nagging, there has been a statistically significant change in the total energy consumption in the building (or, to put it another way, there is less than a 2 out of 100 chance that the variance since the onset-of-nagging could have occurred, well, by chance alone).
2. The SIZE of the impact is that, on average, about 41,000 kw-hrs of electricity have been saved per MONTH (that is, 451,000 kw-hrs of electricity have been forgone – or it is "forwent"? – in the past 11 months). That annualizes out to about a half-of-a-MILLION kilowatt hrs (more than $55,000 worth of electricity)! Yikes!
3. We have cut down our total electricity consumption by over 11%, and painlessly. And NO ONE has complained
4. The Nag is one hell of a great guy.

<u>Recommendations and other Nagging</u>

The Nag has shown that, by educating the intelligent folks in our building (and tramping on those who aren't), it is easy to save a huge chunk of our electricity consumption. Common sense says if you turn off the air-conditioning when not needed, and turn off the lights and work-related paraphernalia at the end of the day you can save energy. But, more important, the Nag thinks that there might even be a small cultural shift going on in the building. Administration can assist in fostering the continuation of this energy-consumption success (and maybe even MORE energy savings) but talking about it occasionally, sharing the results with other Center managers in other buildings (wouldn't it be great if Sandia overall could save 10% of its energy consumption?), and rewarding the Building residents periodically with cheese.

Which brings The Nag to his final recommendation: the Center management should host a FREE LUNCH for everyone in the building, and do it periodically (say, once a quarter) so long as these savings continue. We'll call it the "Nag Rag Feed Bag". And The Nag will bring the beer.

Respectfully,
The Energy Nag